WHAT IS CLAIMED IS:

1. A light-emitting semiconductor device which comprises an n-layer of n-type gallium nitride compound semiconductor ($Al_xGa_{1-x}N$; inclusive of x=0) and an i-layer of insulating gallium nitride compound semiconductor ($Al_xGa_{1-x}N$; inclusive of x=0) doped with p-type impurities, wherein at least one of said n-layer and said i-layer is of double-layer structure, the respective layers of said double-layer structure having different concentrations.

2. A light-emitting semiconductor device as claimed in Claim 1, wherein said n-layer is of double-layer structure including an n-layer of low carrier concentration and an n^+-layer of high carrier concentration, the former being adjacent to said i-layer.

3. A light-emitting semiconductor device as claimed in Claim 1, wherein said i-layer is of double-layer structure including an i_L-layer of low impurity concentration containing p-type impurities in comparatively low concentration and an i_H-layer of high impurity concentration containing p-type impurities in comparatively high concentration, the former being

adjacent to said n-layer.

4. A light-emitting semiconductor device as claimed in Claim 1, wherein said n-layer is of double-layer structure including an n-layer of low carrier concentration and an n^+-layer of high carrier concentration, the former being adjacent to said i-layer, and said i-layer is of double-layer structure including an i_L-layer of low impurity concentration containing p-type impurities in comparatively low concentration and an i_H-layer of high impurity concentration containing p-type impurities in comparatively high concentration, the former being adjacent to said n-layer.

5. A light-emitting semiconductor device as claimed in Claim 1, wherein the thickness of said n-layer is 2.5 - 12 μm.

6. A light-emitting semiconductor device as claimed in Claim 1, wherein the carrier concentration of said n-layer is $1 \times 10^{14} - 1 \times 10^{19}$ /cm^3.

7. A light-emitting semiconductor device as claimed in Claim 2, wherein the thickness of said n-

layer of low carrier concentration is 0.5 - 2 μm and the thickness of said n^+-layer of high carrier concentration is 2 - 10 μm.

8. A light-emitting semiconductor device as claimed in Claim 2, wherein the carrier concentration of said n-layer of low carrier concentration is $1 \times 10^{14} - 1 \times 10^{17}$ /cm^3 and the carrier concentration of said n^+-layer of high carrier concentration is $1 \times 10^{17} - 1 \times 10^{19}$ /cm^3.

9. A light-emitting semiconductor device as claimed in Claim 1, wherein the thickness of said i-layer is 0.03 - 1.3 μm.

10. A light-emitting semiconductor device as claimed in Claim 1, wherein the impurity concentration of said i-layer is $1 \times 10^{16} - 5 \times 10^{20}$ /cm^3.

11. A light-emitting semiconductor device as claimed in Claim 3, wherein the thickness of said i_L-layer of low impurity concentration is 0.01 - 1 μm and the thickness of said i_H-layer of high impurity concentration is 0.02 - 0.3 μm.

12. A light-emitting semiconductor device as claimed in Claim 3, wherein the impurity concentration of said i_L-layer of low impurity concentration is 1×10^{16} - 5×10^{19} /cm^3 and the impurity concentration of said i_H-layer of high impurity concentration is 1×10^{19} - 5×10^{20} /cm^3.

13. A light-emitting semiconductor device as claimed in Claim 2, wherein said n^+-layer of high carrier concentration is doped with silicon.

14. A light-emitting semiconductor device as claimed in Claim 4, wherein said n^+-layer of high carrier concentration is doped with silicon.

15. A light-emitting semiconductor device as claimed in Claim 3, wherein both said i_L-layer of low impurity concentration and said i_H-layer of high impurity concentration are doped with zinc, the amount of doped zinc in said i_H-layer of high impurity concentration being higher than that in said i_L-layer of low impurity concentration.

16. A light-emitting semiconductor device as claimed in Claim 4, wherein both said i_L-layer of low impurity concentration and said i_H-layer of high

impurity concentration are doped with zinc, the amount of doped zinc in said i_H-layer of high impurity concentration being higher than that in said i_L-layer of low impurity concentration.

17. A method for producing a light-emitting semiconductor device comprising an n-layer of n-type gallium nitride compound semiconductor ($Al_xGa_{1-x}N$; inclusive of x=0) and an i-layer of insulating gallium nitride compound semiconductor ($Al_xGa_{1-x}N$; inclusive of x=0) doped with p-type impurities from organometal compound by vapor phase epitaxy, comprising the steps of:

feeding a silicon-containing gas and other raw material gases together at a controlled mixing ratio to a substrate; and

growing said n-layer having a controlled conductivity.

18. A method as claimed in Claim 17, comprising:

growing an n^+-layer of high carrier concentration, which is an n-type gallium nitride compound semiconductor ($Al_xGa_{1-x}N$; inclusive of x=0) having a comparatively high conductivity, on said substrate

having a buffer layer of aluminum nitride formed thereon, by feeding said silicon-containing gas and said other raw material gases together at a controlled mixing ratio; and

growing an n-layer of low carrier concentration, which is an n-type gallium nitride compound semiconductor ($Al_xGa_{1-x}N$; inclusive of $x=0$) having a comparatively low conductivity, on said n^+-layer, by feeding said raw material gases excluding said silicon-containing gas.

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